

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 8

REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Office Action and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Drawings

The Office Action has objected to the drawings. It is respectfully submitted that the attached substitute drawing sheets overcome the Office Action objections.

Specifically, the Office Action objected to Figures 1A and 1B because they should include a designated legend such as "Prior Art". Figures 1A and 1B have been amended and they now include the requisite legend "Prior Art".

Further, the Office Action has objected to Figure 2, contending that item 24 should be labeled "buffer memory", item 25 should be labeled "Branch Metric Calculation Unit", reference numbers 34 and 36 need to be rearranged, there is no linkage between controller 32 and decoder 20, item 30 should be labeled "log likelihood ratio unit", and items 36 and 38 should be labeled "short term" and "long term", respectively. As indicated in red ink on the attached substitute sheets, Figure 2 has been amended to include the above labels as stated in the specification. The reference numbers 34 and 36 have been rearranged and a connection line has been added to link controller 32 to decoder 20.

Further, the Office Action has objected to the Figures 3A and 3B, contending that they should be combined into one drawing, namely, Figure 3. As indicated in red ink on the attached substitute sheets, Applicant has amended Figures 3A and 3B to be combined into one Figure, namely FIG. 3, as suggested by the Office Action.

Applicant respectfully submit that the amendments to the drawings overcome the Office Action's objections and do not add any new matter to the application.

A complete set of formal drawings, incorporating the amendments herein, is being submitted concurrently with this Amendment.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 9

Specification

The Office Action has objected to the Title of the Invention contending that the Title is not descriptive. A new title has been submitted. It is respectfully submitted that the new title is properly descriptive of the subject matter of this application.

The Office Action objected to the Abstract contending that the term "wherein" should be inserted at line 1 between the two words "...symbols, the...". The abstract has been amended to include the word "wherein" between the two words, as requested by the Office Action. In view of this amendment, Applicant respectfully requests that the objection to the Abstract be withdrawn.

Additionally, the Office Action objected to various informalities in the specification. It is respectfully submitted that all the informalities pointed out by the Office Action have been removed by the present amendment of the specification, as shown by the marked-up copy of the substitute specification submitted herewith. In view of this amendment, Applicant respectfully requests that the Office Action withdraw the objections to the specification.

Specifically, Applicant has corrected and/or addressed the following informalities pointed out by the Office Action:

- The term "pre-calculating" should be replaced with "calculating". It is respectfully submitted the term "pre-calculating" has been replaced with the term "calculating" only in the Abstract.

- The Office Action objected the use of "further alternatively or additionally" contending that this should be limited to only one transitional phrase. Applicant respectfully traverse this objection. Although many instances of the phrase "further alternatively" have been removed from the specification, it is respectfully submitted that certain aspect of the invention may be implemented as either in additional or an alternative feature.

- In page 5, line 6 the sentence starts with "There is therefore..." has been reworded as "Therefore there is ..."

- It is respectfully submitted that the term "preferably" has been removed in some appropriate places throughout the specification.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 10

- The Office Action indicated that "All reference numbers throughout the specification should be in parenthesis". It is respectfully submitted that throughout the specification the term "block" has been added to reference number in parenthesis.

It is respectfully submitted that the specification has been reviewed to the extent necessary to determine the presence of minor errors. Minor errors have been corrected.

A substitute specification is being filed herewith under 37 CFR 1.125(b) as well as a marked-up copy showing the amendments made via the substitute specification relative to the specification as originally filed. The substitute specification contains no new matter.

Status of Claims

Claims 1, 3 - 9, 11, 15 - 19, 21 - 27, 29 - 31, 33, and 43 - 49 are pending in the application. Claims 2, 10, 12, 20, 28, 32, 34-42 have been canceled without prejudice to their reentry at a later stage or in a related application. Claims 1, 3 - 9, 11, 15 - 19, 21 - 27, 29 - 31, 33, and 43 - 49 have been amended. Applicant respectfully assert that the amendments to the claims do not add any new matter to the application.

35 U.S.C. 112 Rejections

The Office Action rejected claims 1-34, 37-38, 40, and 42-49 as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 1, 3, 4, 6 and 15 have been amendment to remove any potentially indefinite language and, thereby, to overcome the above rejections. Claims 2, 10, 12, 20, 28, 32 and 34-42 have been canceled and, therefore, the Office Action rejection of these claims are now moot. . As to an alleged lack of antecedent basis in some of the claims, Applicant respectfully submits that each claim has been revisited and all instances of potential lack of antecedent basis have been addressed. Furthermore, Applicant respectfully submits that the claims have been amended to make the claim language clear and concise. Applicant respectfully assert that claims 1, 3 -9, 11, 15-19, 21-27, 29-31, 33, and 42-49, as amended, are proper under 35 USC 112 and request that the indefiniteness rejections be withdrawn.

35 U.S.C. § 103 Rejections

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 11

The Office Action rejected claims 1 - 49 under 35 U.S.C. 103(a) as being unpatentable over Lerzar (USPN 6343368 B1, referred to as Lerzar) in view of Viterbi et al. (USPN 5933462, referred to as Viterbi).

Applicant believes that this rejection should be withdrawn in view of the above amendments and the following remarks.

As is well established, an obviousness rejection requires a teaching or a suggestion by the relied upon prior art of all the elements of a claim (MPEP 2142).

Applicant respectfully assert that neither Lerzar nor Viterbi, alone or in combination, teach or suggest the limitations of claims 1, 3 - 9, 11, 15-19, 21-27, 29-31, 33, and 42-49, as amended.

Specifically, neither Lerzar nor Viterbi, alone or in combination, teach or suggest "re-calculating at least some of the state metric vectors based on the stored reference vector", as recited in amended claim 1. (1)

Accordingly, Applicant respectfully assert that a *prima facie* case of obviousness over claim 1 cannot be established, and Applicant respectfully request that the rejection be withdrawn.

Claims 3 - 9, 11 and 13 - 22 are dependent from claim 1 and, therefore, it is respectfully submitted that these claims are patentable at least for the reason given above. Accordingly, Applicant respectfully requests that the rejection of amended claims 3 - 9, 11 and 13 - 22 also be withdrawn.

Claim 23, as amended, recites, inter alia, "calculating a plurality of state metric vectors from a block of symbols in a first direction; storing a reference vector of the calculated state metric vectors; and calculating the state metric vectors from a block of symbols in a second direction based on the stored reference vector".

Applicant respectfully asserts that neither Lerzar nor Viterbi, alone or in combination, teach or suggest at least "calculating the state metric vectors from a block of symbols in a second direction based on the stored reference vector", as recited in amended claim 23. (2)

Accordingly, Applicant respectfully submits that a *prima facie* case of obviousness over claim 23 cannot be established, and Applicant respectfully request that the rejection of claim 23 be withdrawn.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 12

Since claims 24 - 27, 29 - 31 and 33 are dependent from claim 23, Applicant believes the rejection of these claims is overcome at least for the reasons given above. Accordingly, it is respectfully requested that the rejection of claims 24-27, 29-31 and 33 be withdrawn.

Claim 43, as amended, recites, inter alia, "circuitry to calculate state metric vectors from a block of symbols in a predetermined direction and a memory having a long term storage area to store a reference vector of the calculated state metric vectors and a short term storage to store at least some of the re-calculated state metric vectors which are re-calculated from the block of symbols in the predetermined direction based on the stored reference vector".

Applicant respectfully submit that neither Lerzar nor Viterbi, alone or in combination, teach or suggest "a memory having a long term storage area to store a reference vector of the calculated state metric vectors and a short term storage to store at least some of the re-calculated state metric vectors which are re-calculated from the block of symbols in the predetermined direction based on the stored reference vector" as recited in amended claim 43. (3)

Accordingly, Applicant respectfully assert that a *prima facie* case of obviousness over claim 43 cannot be established, and Applicant respectfully request that the rejection of claim 43 be withdrawn.

Since claims 44 - 49 are dependent from claim 43, Applicant believes the rejection of these claims has been overcome for at least the same reason, and Applicant respectfully requests that the rejection be withdrawn.

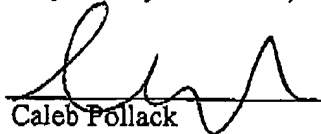
In view of the foregoing amendments and remarks, the pending claims of the above-identified application are deemed to be allowable. Favorable reconsideration and allowance of the application are respectfully requested.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 13

Should the Examiner have any question or comment as to the form, content or entry of this Amendment, the Examiner is requested to contact the undersigned at the telephone number below. Similarly, if there are any further issues yet to be resolved to advance the prosecution of this application to issue, the Examiner is requested to telephone the undersigned counsel.

Please charge any fees associated with this paper to deposit account No. 05-0649.

Respectfully submitted,



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Dated: January 23, 2003

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APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 14

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Drawings, the following changes were made:

Figs. 1A, 1B, 2 and 3 were amended as indicated in red ink.

In the title the following changes were made:

[BAHL DECODING] APPARATUS AND METHOD OF STORING REFERENCE
VECTOR OF STATE METRIC

In the Abstract the following changes were made:

A method of calculating recursive state metric vectors of a block of symbols wherein the state metric vectors being supplied to an output calculating unit. The method includes [pre-]calculating the state metric vectors from a first side of the block, and calculating for a second time at least some of the state metric vectors from the first side of the block.

In the specification, a version of a substitute specification under 37 CFR 1.125(b) with markings to show changes made is being submitted herewith. It is respectfully asserted that no new matter has been added to the specification.

In the claims, the following changes were made:

1. (Once Amended) A method [of calculating recursive state metric vectors of a block of symbols, the state metric vectors being supplied to an output calculating unit,] comprising:
storing a reference vector of [pre-calculating the] a state metric comprising a plurality of vectors calculated, [from] in a predetermined [side] direction, [of the] from a block of symbols; and

re-calculating [for a second time] at least some of the state metric vectors [from the of the block of symbols] based on the stored reference vector.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 15

3. (Once Amended) A method according to claim 1, [comprising] wherein storing comprises storing [fewer than all the pre-calculated] two or more reference vectors.

4. (Once Amended) A method according to claim [3] 1, wherein re-calculating [for a second time] at least some of the state metric vectors comprises calculating [those] state metric vectors which were not stored as reference vectors.

5. (Once Amended) A method according to claim [4] 3, wherein storing [fewer than all the pre-calculated] two or more reference vectors comprises storing a number of reference vectors which is about the square root of the number of [pre-calculated] the calculated state metric vectors.

6. (Once Amended) A method according to claim 3, wherein storing [fewer than all the pre-calculated] two or more reference vectors comprises storing vectors selected responsive to [the] locations of singular functions used in the [pre-]calculating of the calculated state metric.

7. (Once Amended) A method according to claim 3, wherein storing [fewer than all the pre-calculated] two or more reference vectors comprises storing vectors selected in predetermined intervals.

8. (Once Amended) A method according to claim 7, wherein storing two or more reference vectors selected in predetermined intervals comprises storing reference vectors with equal intervals between them.

9. (Once Amended) A method according to claim 7, wherein storing two or more reference vectors selected in predetermined intervals comprises storing reference vectors with intervals of decreasing size between them.

11. (Once Amended) A method according to claim [3] 1, wherein re-calculating [for a second time the] at least some of the state metric vectors comprises calculating at least some

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 16

[of the at least some] of the state metric vectors using a reverse function of a function used in the [pre-]calculating the reference vector of the state metric.

15. (Once Amended) A method according to claim [13] 1, wherein re-calculating [for the second time] comprises calculating at least some of the vectors using [the] a function which was used in the [pre-]calculation of the reference vector of the state metric.

16. (Once Amended) A method according to claim 1, further comprising:
[wherein the pre-]calculating the state metric by [is performed] using
a function which is an approximation of an original function; and
re-calculating [for a second time] the at least some of the state metric
vectors [comprises calculating at least some of the at least some of the
vectors] by using a reverse function of the original function.

17. (Once Amended) A method according to claim 1, wherein storing the reference vector further comprises [the pre-]calculating [is performed] the state metric vectors from the block of symbols in the predetermined direction by using a function which is an approximation of an original function when the original function is non-reversible.

18. (Once Amended) A method according to claim [1] 17, wherein [pre-]calculating the state metric vectors from [a first side of] the block of symbols in the predetermined direction comprises forward calculating [forward] of the state metric vectors.

19. (Once Amended) A method according to claim [1] 17, wherein [pre-]calculating the state metric vectors from [a first side of] the block of symbols in the predetermined direction comprises backward calculating [backward] of state metric vectors.

21. (Once Amended) A method according to claim [1] 16, wherein [pre-]calculating the state metric [vectors] comprises [pre-]calculating a number of vectors substantially equal to [of the] a size of an encoding block.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 17

22. (Once Amended) A method according to claim [1] 16, wherein [pre-]calculating the state metric [vectors] comprises [pre-]calculating a number of vectors substantially smaller than [the] a size of an encoding block.

23. (Once Amended) A method [of calculating recursive state metric vectors from opposite sides of a block of symbols, the state metric vectors being supplied to an output calculating unit,] comprising:

[pre-]calculating a plurality of state metric vectors from a block of symbols in a first [side] direction [of the block];

storing [fewer than all] a reference vector of the [pre-]calculated state metric vectors;
and

calculating the state metric vectors from a block of symbols in a second [side] direction [of the block] based on the stored reference vector. [after pre-calculating the plurality of state metric vectors from the first side of the block.]

24. (Once Amended) A method according to claim 23, comprising re-calculating [at least one of the] a first state metric vector[s] from the block of symbols in the first [side] direction [of the block for a second time] after calculating [at least one of the] a second state metric vector[s] from the block of symbols in the second [side] direction [of the block of].

25. (Once Amended) A method according to claim 24, wherein re-calculating [at least one of] the first state metric vector[s] from the block of symbols in the first [side] direction [of the block for a second time] comprises calculating the [at least one of the] first state metric vectors [from] based on the stored reference vector[s].

26. (Once Amended) A method according to claim [25] 23, wherein storing [fewer than all the pre-calculated] the reference vector[s] comprises storing two or more reference vectors calculated in predetermined intervals.

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 18

27. (Once Amended) A method according to claim 24, wherein calculating the first [at least one of the] state metric vector[s] comprises calculating the first state metric vector based on a closest stored reference vector.

29. (Once Amended) A method according to claim 23, further comprising:
storing two or more reference vectors;
dividing [wherein] the block of symbols [is divided] into a [plurality of] two or more segments defined by the stored reference vectors; and
[comprising] re-calculating for [substantially all] the two or more segments [at least one of] the first state metric vector[s for a second time] based on [the] a respective stored reference vector[s] of the segment.

30. (Once Amended) A method according to claim 29, wherein re-calculating for [substantially all] the two or more segments comprises re-calculating state metrics for [all] some of the two or more segments[except the first segment].

31. (Once Amended) A method according to claim 29, comprising storing [the at least one of the vectors which was calculated for the second time] a re-calculated reference vector of the re-calculated state metric.

33. (Once Amended) A method according to claim [32] 31, comprising storing [substantially all] the vectors of the re-calculated state metrics of the segment. [which were calculated for the second time.]

43. (Once Amended) An apparatus [A state metric calculation unit,] comprising:
circuitry [for recursively] to calculate[ing] state metric vectors from a block of symbols in a [first side] predetermined direction [of a block including a predetermined number of symbol groups]; and
a memory having a long term storage area [for] to store[ing] a reference vector of the calculated state metric vectors and a short term storage to store at least some of the re-

APPLICANT(S): LEVY, Sharon et al.
SERIAL NO.: 09/371,275
FILED: August 10, 1999
Page 19

calculated state metric vectors which are re-calculated from the block of symbols in the predetermined direction based on the stored reference vector.

[which has a maximal storage space for state metric vectors substantially smaller than that required to store the predetermined number of state metric vectors].

44. (Once Amended) [A calculation unit according to] The apparatus of claim 43, wherein [the] a maximal storage space of the memory [has room for] is capable to store[ing] less than fifty percent of [the] a predetermined number of the state metric vectors.

45. (Once Amended) [A calculation unit according to] The apparatus of claim 43, wherein the maximal storage space of the memory [has room for] is capable to store[ing] less than twenty percent of the predetermined number of state metric vectors.

46. (Once Amended) [A calculation unit according to] The apparatus of claim 43, wherein the circuitry implements a plurality of different functions for calculating the state metric vectors.

47. (Once Amended) [A calculation unit according to] The apparatus of claim 46, wherein the circuitry implements a pair of functions for calculating the state metric vectors which pair comprise mutual reverse functions.

48. (Once Amended) [A calculation unit according to] The apparatus of claim 43, wherein [the memory comprises a] the long term storage area [for storing] is used to store two or more [pre-calculated state metric] reference vectors in predetermined intervals and [a] the short term storage area [for storing] is used to store the calculated state metric vectors between two reference vectors.

49. (Once Amended) [A calculation unit according to] The apparatus of claim 48, wherein the long term storage area serves for storing also state metric vectors from between two reference vectors.

1/6

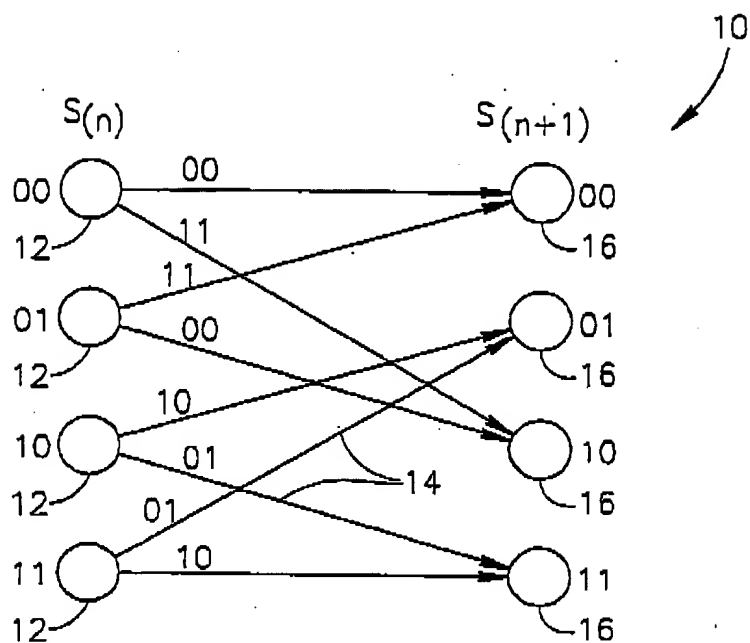


FIG.1A
PRIOR ART

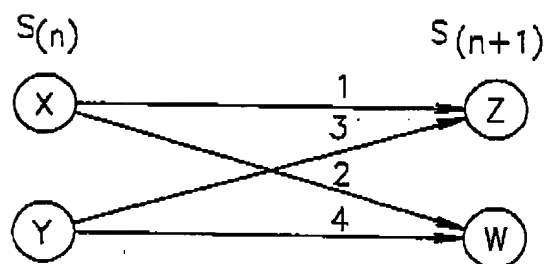


FIG.1B
PRIOR ART

2/6

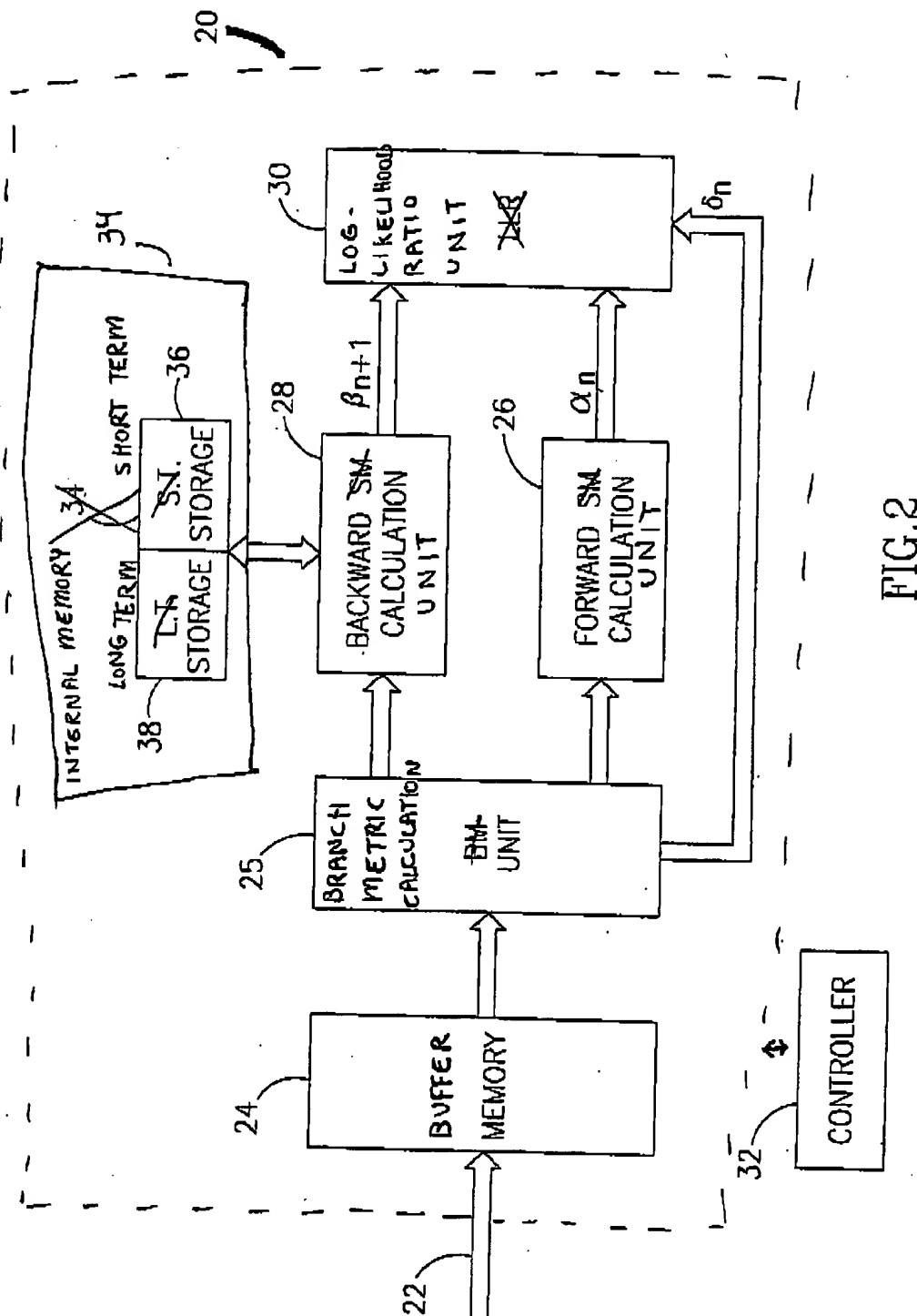


FIG.2

3/6

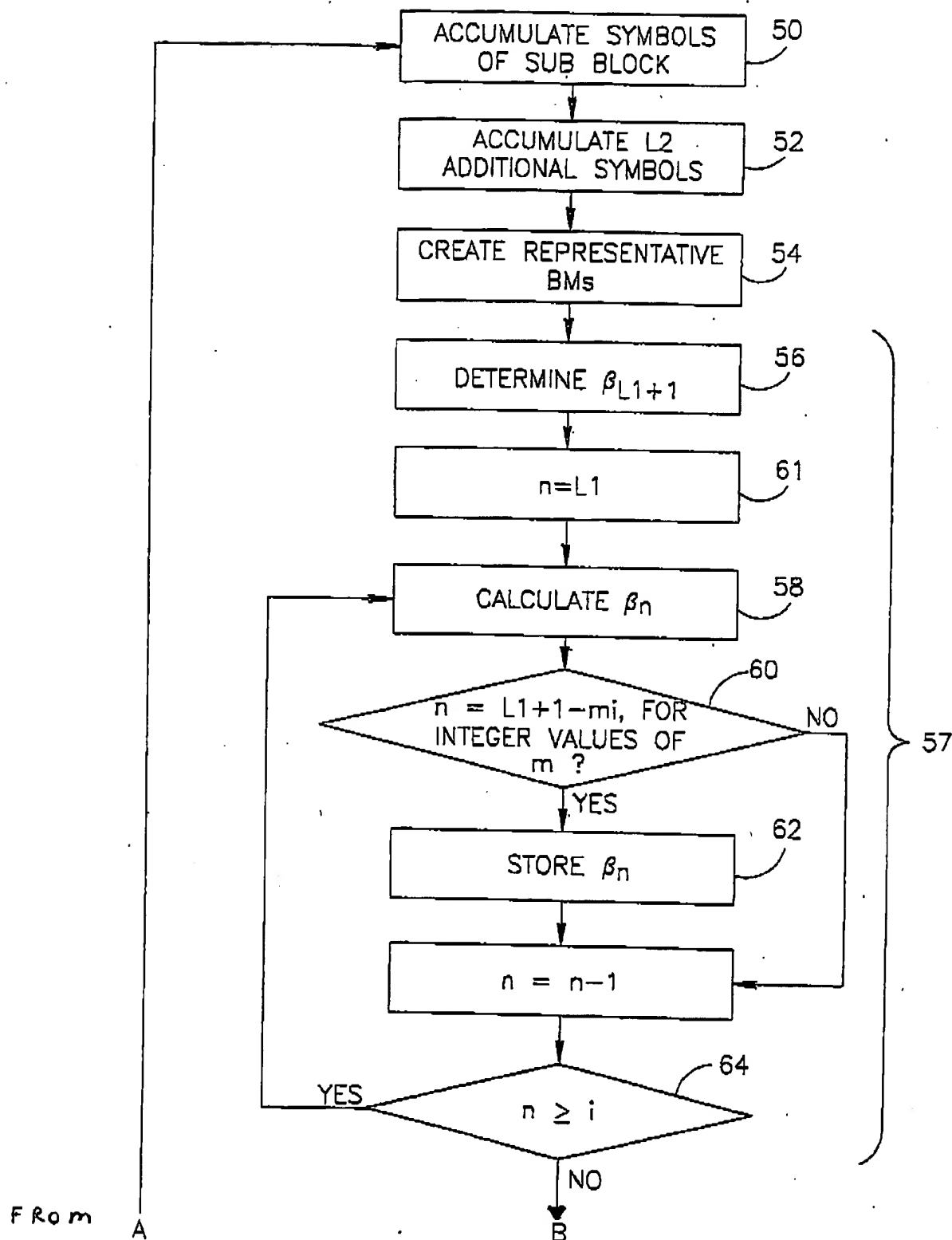


FIG. 3A

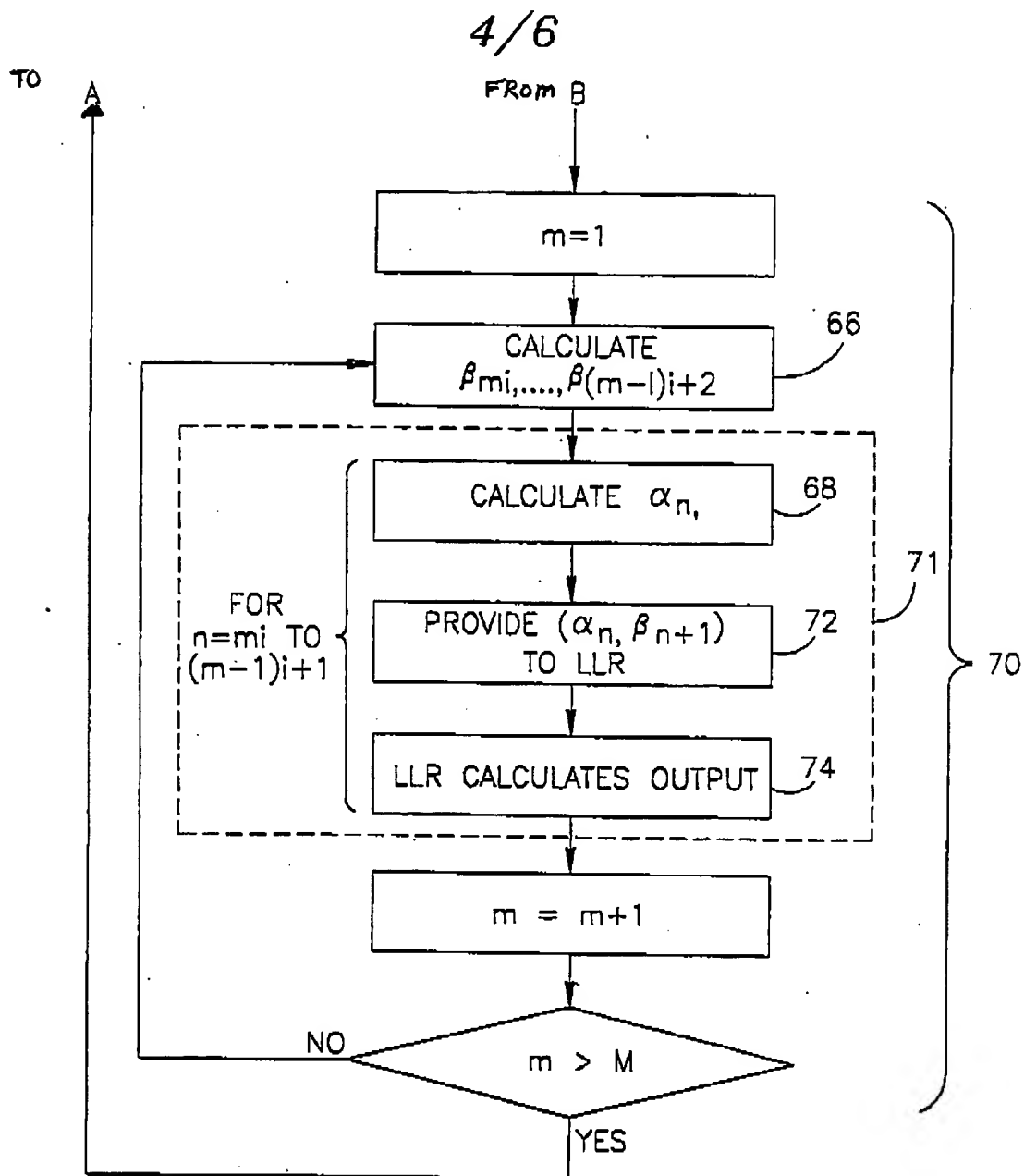


FIG. 3

CONTINUATION OF FLOW CHART